ducts. Important work might also be done in studying the development of districts differing widely in climate and temperature.

A vote of thanks to Mr. Fisher was proposed by Sir Alfred Keogh and seconded by Sir John S. Young. Sir Alfred Keogh expressed the hope that the scheme described by Mr. Fisher would be instrumental in promoting constant interchange of views between men of science in this country and in Australia. As an illustration of the practical applications of science, Sir Alfred referred to the care of the wounded and their treatment during convalescence. A striking instance had been the suppression of typhoid fever. To-day there are only twenty-two cases in the British Army in France, whereas if we had gone on in the old way the number of cases would probably have reached 80,000 or 100,000.

The Lord Mayor and Mr. Andrew Fisher have been elected vice-presidents of the Guild; and the Executive Committee for the year 1916–17 is constituted as follows:—President, Right Hon. Sir William Mather; chairman of committees, Sir Norman Lockyer, K.C.B., F.R.S.; vice-chairmen of committees, Sir Hugh Bell, Bt., Hon. Sir John Cockburn, K.C.M.G.; honorary treasurer, Right Hon. Lord Avebury; honorary assistant treasurer, Lady Lockyer; deputy chairman, Sir Boverton Redwood, Bt.; vice-presidents, Sir William Phipson Beale, Bt., K.C., M.P., Surgeon-General Sir Alfred Keogh, K.C.B., Major O'Meara, R.E., C.M.G., Right Hon. Lord Sydenham, G.C.M.G., G.C.S.I., F.R.S.; hon. secretaries, Sir Alexander Pedler, C.I.E., F.R.S., Dr. F. Mollwo Perkin; other members, Captain Bathurst, M.P., Dr. G. T. Beilby, F.R.S., Mr. W. H. Cowan, M.P., Prof. R. A. Gregory, Sir Robert Hadfield, F.R.S., Prof. A. Liversidge, F.R.S., Sir Philip Magnus, M.P., Dr. T. A. Matthews, Mr. Robert Mond, Prof. John Perry, F.R.S., Sir Ronald Ross, K.C.B., F.R.S., Mr. Alan A. Campbell Swinton, F.R.S., Lady Napier Shaw, Mr. Carmichael Thomas, Dr. R. Mullineux Walmsley, Dr. Howard S. Willson, and Colonel Sir John S. Young, C.V.O.

NOTES.

The Summer Time Bill received the Royal Assent on May 17, and came into force at 2 a.m. on Sunday, May 21. From now until the end of September three systems of time-reckoning will be legal, namely, (1) Greenwich Time, for tides and other occurrences of navigation and astronomy; (2) local time, which is based on distances from Greenwich in latitude and longitude, and determines lighting-up times; and (3) Summer Time, which is an hour in advance of Greenwich Mean Time. The third clause of the Act states that "during the prescribed period any expression of time in any Act of Parliament, Order in Council, order, regulation, rule, or by-law, or in any timetable, notice, advertisement, or other document, is to mean 'Summer Time.'" Orders as to lighting-up must, however, be excluded from the field of operations of this clause, as they refer to an interval and not to a particular hour. Time-tables showing lighting-up times in different parts of the kingdom are in common use, and are given in many calendars and almanacs These times are determined by actual sunrise or sunset as points of reference, being at present half an hour before and after respectively. The sun rises today, for example, at nearly 4 a.m. in London and sets a little before 8 p.m.; lamps of vehicles must, therefore be lighted up to 3.30 a.m. G.M.T., and after 8.30 p.m. The corresponding times at Glasgow are 4.38 a.m. for sunrise, 8.38 p.m. for sunset, and lighting-up times to about 4 a.m. and after 9 p.m. All these times are ultimately based on Greenwich Time, with the necessary differences; and it will be a problem for many a village policeman to decide when lamps have really to be lighted. *Symons's Meteorological Magazine* for May, in an article deploring the adoption of the measure, prints a letter from Sir Napier Shaw, director of the Meteorological Office, instructing observers to record their observations and attend at their offices and observatories according to the hours of Greenwich Mean Time, as heretofore, which shows that in the Government meteorological service the Act is simply to be ignored, as it must be in meteorological work generally. So far as we know, not a single daily paper has shown an intelligent appreciation of the relation of daylight to time-standards, but we are glad to acknowledge that, in the technical Press, the *Electrical Review* has consistently condemned the principle involved in the new measure, as well as contested the claims put forward by its advocates. It remains to be seen whether the promised social and economic advantages of the Act will justify the use of Summer Time over the whole kingdom either during the war or after.

At a meeting held at Burlington House on May 23, attended by representatives of many leading firms concerned with chemical industries, it was resolved that British firms engaged in the chemical and allied trades should form an association (1) to promote closer co-operation and to place before the Government the views of the chemical trade generally; (2) to further industrial research; and (3) to facilitate closer co-operation between chemical manufacturers and various universities and technical schools.

In an interesting and suggestive address delivered at the inaugural meeting of the Ferrous Section of the Metallurgical Committee of the Advisory Council for Scientific Research on May 8, Sir Robert Hadfield put forward a proposal for the establishment of a Central Bureau of information as to materials existing within the British Empire. As he pointed out, when it is a question of the adoption of a new metallurgical invention or development, it is absolutely necessary to know the locality and extent of the materials which will be required. Neither the work of the Geological Survey, nor that of the Department of Mines in the Home Office, nor that of the Imperial Institute really covers this field. It is true that Dr. Strahan, the director of the Geological Survey and Museum, Jermyn Street, has recently begun the issue of a series of special reports on the mineral resources of Great Britain. But something very much broader and bigger than this is required. How restricted is the scope of activities of the Geological Survey may be illustrated from the fact that it does not include Ireland. The ores existing in that country are not known officially in this country at all; and the basis of such information as does exist rests upon the partial work of one man, who is remunerated to the extent of 100*l*. per annum. Moreover, the maps issued by the Geological Survey in this country do not furnish sufficient information as to minerals of economic value. With proper organisation the value of metallurgical products within the British Empire could be very greatly increased, and the proposal made by Sir Robert Hadfield as to the necessity of a Central Imperial Bureau of information is one that will receive the support of everyone acquainted with the actual state of affairs revealed as the war has progressed.

ON the invitation of Sir Alfred Keogh, rector of the Imperial College of Science and Technology, about fifty members of the Commercial Committee and other members of Parliament visited the college on May 18. Mr. Arthur Acland, the chairman of the Executive Committee of the governing body, welcomed them on behalf of the governors, and gave a short historical account of the college, with particulars of the staff, students, and buildings. Referring to education at public schools, Mr. Acland said that boys came to the college very ill-prepared to take up scientific studies; this no doubt was largely due to the bias in favour of the classical as against the modern or scientific side still existing in most schools, and he urged upon the members of Parliament present the necessity of a full inquiry into our public-school system. Dealing with higher education, he showed how technical training had suffered in the past from lack of funds, and the haphazard manner in which successive Governments had dealt with it. In this country there were no benefactions to education on the scale of those given in the United States, nor large State grants as in Germany. He referred to the sites still unbuilt upon in the Imperial College owing to want of money, and made a strong appeal for the development of scientific institutions generally. It was important that development should be systematic, with a view to the future needs of the Empire. On the conclusion of Mr. Acland's speech, the committee proceeded to inspect the departments, including those of chemistry, physics, fuel technology, engineering, mining, metallurgy, geology and oil technology, and plant physiology and pathology. After the tour the members met at the Imperial College Union, and the rector, in reviewing the purposes of the college, illustrated the country's recent dependence on Germany for highly trained men of science by mentioning that when he first came to the college students who had been trained in botany were obliged to go to places like Munich for training in plant physiology and pathology, and that a regular employment agency for economic botanists for the British Empire existed at that time in Berlin. This was now changed by the action of the college. He urged industrial people to bring their industrial problems to the college, where they would be worked out for them. On behalf of the commercial committee, Major Chapple and Sir Archibald Williamson expressed their thanks and the great pleasure the visit had afforded them.

THE annual visitation of the Royal Observatory, Greenwich, will be held on Saturday, June 3.

SIR ALFRED EWING, F.R.S., Director of Naval Education, has been appointed principal of the University of Edinburgh, in succession to the late Sir William Turner.

ON Thursday, June 22, the Royal Society's Croonian lecture will be delivered by Prof. S. J. Hickson, on "Evolution and Symmetry in the Order of the Sea-pens."

WE learn from the *Times* of May 20 that the archæologist, Dr. P. V. Nikitine, vice-president of the Russian Academy of Sciences, died on May 18 in Petrograd.

THE REV. J. LLEWELYN DAVIES died on May 18 at Hampstead at ninety years of age. Mr. Davies was an original member of the Alpine Club, and made the first ascents of the Dom and the Täschhorn. He was elected one of the members of the first London School Board in succession to Huxley. He was associated with F. D. Maurice in the foundation of the Working Men's College in 1854, and was for a time principal of Queen's College, Harley Street, London, W.

THE band of the Coldstream Guards will play at the Royal Botanic Gardens on Saturday and Sunday afternoons during the season, commencing June 3. Future arrangements include the National Rose Show and other events of botanical, social, and charitable purpose.

THE death has occurred of Dr. T. J. Burrill, who was professor of botany at the University of Illinois from 1870 to 1912. From 1891 to 1894, and again in 1904, he was also acting-president of that institution. He was president of the American Microscopical Society during 1885 and 1886, and its secretary from 1886 to 1889. He served as a botanist in connection with the U.S. Agricultural Experiment Station from 1888 to 1912. At the time of his death Dr. Burrill had almost completed his seventy-seventh year.

MR. H. FLOY, who died recently in New York in his fiftieth year, had considerable repute as an electrical engineer in connection with hydraulic and high-tension long-distance transmission work. From 1892 to 1898 he was associated with the Westinghouse Company, and had afterwards practised independently as a consulting engineer. He was a member of the jury of awards at the St. Louis Exposition, and was the author of several works on electrical subjects, as well as of a large number of contributions to technical journals.

THE death is announced of Mr. L. I. Blake, who was professor of physics and electrical engineering at the Rose Polytechnic Institute, Terre Haute, Indiana, from 1884 to 1887, and at the University of Kansas from 1887 to 1906. At various periods he was constructing electrical engineer on the U.S. Lighthouse Board, and chief engineer (afterwards consulting engineer) of the Submarine Signal Co., of Boston. He was also director and engineer of the Blake-Marscher Electric-Static Ore Separating Co., and was a member of several American scientific societies. He was in his sixty-second year at the time of his death.

CAPT. R. J. SMITH, of the Lancashire Fusiliers, who was killed in action on May 5, at the age of twenty-nine, was the eldest son of Mr. O. Smith, of Jigginstown House, Naas, Co. Kildare. He was educated at Mountjoy School, Dublin, was a graduate of Dublin University, and secured a science scholarship in the Royal College of Science for Ireland, receiving the associateship of that college in 1908. He taught in Kilkenny College in 1909, and then in the Technical Institute, Newry, Co. Down, from which he entered the works of the British Westinghouse Company, Manchester, as an engineer. He owed his rapid promotion in the Army to the technical knowledge which he was so fully able to apply.

LIEUT. R. L. VALENTINE, of the 7th Batt. Royal Dublin Fusiliers, who died on April 30 from wounds received near Loos, was a scholar and an associate of the Royal College of Science for Ireland, where he devoted himself especially to natural history and geology. He was the youngest son of Mr. W. J. M. Valentine, of Dublin, and received his earlier education at the High School, Dublin. When the war broke out, he was engaged on a research at Hook Point, Co. Wexford, leading to a correlation of the base of the Carboniferous strata with the recognised horizons of the Avonian series in south-western England. He had also just gained, by competition, a post as geologist on the Geological Survey of Ireland, and he completed the Civil Service qualifying examination when actually in military training. During his service he devised an important method for increasing the efficiency of the Lewis machine-gun. He was keen and untiring in any duty that he undertook, and would undoubtedly have made his mark among scientific men in Ireland. His loss is especially felt by those who had looked forward to his comradeship in public work.

THE death is announced of Dr. James William White, professor emeritus of surgery at the University of Pennsylvania. Born in 1850, he graduated in 1871, and then joined the scientific staff of the Hassler Expedition under Agassiz, returning in 1872 after visiting both coasts of South America and the Galapagos Archipelago. He then settled in Philadelphia, becoming first resident surgeon at the Eastern Penitentiary, and afterwards professor of genito-urinary surgery, professor of clinical surgery, John Rhea Barton professor of surgery, and, finally, emeritus professor of surgery of the University of Pennsylvania when appointed a trustee of the University. He was the author of many papers and works on surgery, and in former years was an athlete of many parts. On the occasion of its quatercentenary in 1906 the University of Aberdeen conferred on him the honorary degree of LL.D. When the war broke out Dr. White devoted himself with characteristic energy to the cause of the Allies, and published many articles in order to enlighten American public opinion on the origin of the outbreak. He was a well-known visitor to this country, where he formed many friendships.

THERE has been a poetic simplicity in the quiet life, just over, of Mr. John Griffiths, Welshman, mathematician, and college tutor, for many years past Senior Fellow of Jesus College, Oxford. Childhood in a farm-house at Llangendeirne, near Kidwelly; schooldays at Cowbridge; half a century of congenial study, research, and not too burdensome teaching in the walls of his college; ten years of repose in the village where he was born. His modesty was extreme, his shunning of company excessive. Happy with a few real friends always close, and with Kidwelly for the Tipperary of his heart, he wanted no outer circle of acquaintances. If he cherished any unsatisfied ambition, it was unexpressed. Fortunately he allowed himself to write—impulsively, nervously, cleverly, but too briefly to do himself justice. He produced a quite early volume on the geometry of the triangle, and some thirty or forty notes and papers for the London Mathematical Society and for journals. Some of these deal with geometry, others with elliptic functions. His pupils, even if many passed from his sight, were lastingly attached to him. Among them were H. W. Lloyd Tanner (deceased), Prof. W. J. Lewis, and the present registrar of the University of Oxford.

IT is reported from Amsterdam that Prof. Karl Schwarzschild, director of the Astrophysical Observatory at Potsdam, has died from illness contracted while on military service. In the early part of the war he was said to have been acting as meteorological expert in connection with aeronautics at Namur, but is now described as having been an officer in the artillery. Prof. Schwarzschild was born at Frankfort in 1873, and took his doctor's degree at Munich in 1896. He was appointed assistant at the Von Kuffner Observatory at Vienna in 1896, was *Privatdozent* at Munich from 1899 to 1901, and became professor of astronomy and director of the observatory at Gottingen in 1902. He succeeded Vogel as director of the great observatory at Potsdam in 1910. Prof. Schwarzschild's contributions to astronomy were very numerous and covered a wide range of subjects. His mathematical investigations of the pressure of sunlight, in relation to the dimensions of the particles acted upon, are well known in connection with theories of the solar corona and the constitution of comets. He gave much attention to stellar photometry, and developed important practical methods of observation in this connection; the use of a coarse grating on the object-glass of a telescope, which has yielded such valuable data for photographic magnitudes, was first adopted by him in 1895. He also attacked, with some success, the problem of applying the objective-prism to the determination of radial velocities. Prof. Schwarzschild was a notable contributor to the investigation of stellar motions and the structure of the universe. His name will be especially identified with the "ellipsoidal" hypothesis as an alternative to the hypothesis of two star streams, suggested by Kapteyn. He was elected an associate of the Royal Astronomical Society in 1909. By his death astronomy has lost an investigator of untiring industry and marked originality.

IN spite of the elaborate survey of the pagan tribes of the Malay Peninsula, by Messrs. Skeat and Blagden, much still remains to be done by local workers. In the Journal of the Federated Malay States Museum, vol. vi., part iv., for February last, Mr. J. H. N. Evans, in his account of the aboriginal tribes of Upper Perak, supplies much information interesting to anthropologists. It is generally admitted that the form of the round hut which survives for ritual purposes in Roman temples and Christian churches was originally conditioned by the form assumed in bending by elastic bamboos or branches. But it is curious to note that among most, if not all, of the aboriginal tribes of the peninsula the spells of the magician are performed within a magic circle; in some cases a round hut of leaves is erected within which the magician ensconces himself; in others merely a round frame with hangings is used. This points to a very primitive ritual use of the round hut. The article contains much other valuable information, and is illustrated by photographs of the ethnical types of the tribes visited by Mr. Evans.

THE sixth memoir issued by the South African Institute for Medical Research is a study of the "Trypanosomes of Sleeping Sickness," by Mr. G. P. Maynard, statistician and clinician to the institute. The author, who has applied Prof. Karl Pearson's method of resolving a compound distribution into two "normal" components to a number of length distributions of trypanosomes, adversely criticises several of the conclusions reached by the Sleeping Sickness Commission of the Royal Society. He holds that the published length distributions afford no valid argument as to the identity or otherwise of *T. brucei* and the trypanosome causing disease in man in Nyasaland. Several of Mr. Maynard's conclusions will not pass unchallenged, but his memoir is of great interest, and should be studied by all who wish to master the numerous and perplexing problems suggested by the facts at present known respecting the etiology and epidemiology of sleeping sickness.

THE *Museums Journal* for May contains an excellent and detailed account of the Wellcome Historical Medical Museum, originally formed for the benefit of the seventeenth International Congress of Medicine, held in London in August, 1913. Thanks to the generosity of its founder, Mr. Henry S. Wellcome, the collections then brought together were rearranged and embodied as a permanent institution in 1914. "One of the chief objects of the museum," remarks Mr. C. J. Thompson, its curator, "is to stimulate among medical practitioners of to-day the study of the history of medicine, and thus to suggest fresh fields of research." Mr. Thompson has illustrated his article with some excellent photographs. Other items of interest in this number refer to the considerable extension of museum work in Germany. One new picture gallery and no fewer than sixteen war museums have been founded since hostilities began. This contrasts unfavourably with the efforts, in the name of "economy," which have been made to *close* museums in Great Britain.

MR. H. F. WITHERBY makes his fourth series of records on the moulting and sequences of plumage in the British Passeres in the May number of *British Birds*. This is, of its kind, a most admirable piece of work, and should earn the gratitude of all ornithologists. In the course of the present article he gives a most interesting example at one and the same time of the recapitulation theory and the disappearance of structures by degeneration, or "evolution by loss," as Prof. Bateson has it. To wit, he shows that in the larks the outermost primary in the first, teleoptyle, plumage is almost twice as large as that produced in the next and all subsequent moults, this outermost quill having, for some reason, become superfluous. In the same issue Miss E. L. Turner makes some noteworthy observations on the breeding habits of the sheldrake. She adds to our knowledge of their courtship habits, as well as to that of their post-nuptial behaviour. At one point on Holy Island, the scene of her studies, she found sheldrakes breeding in considerable numbers, and here, while the females were incubating, the males indulged in "regular organised games, and were more or less gregarious." On other parts of the island they were breeding in isolated pairs, and in these cases the males would "sit about in solitary grandeur."

THE results of a botanical exploration of Lower California are given in a useful paper by Mr. E. A. Goldman in Contributions from the United States National Herbarium, vol. xvi., part 14. The author and Mr. Nelson spent nearly a year in traversing this interesting region, which floristically is separable into two main divisions, one identical with that of southern California, the other, in the south, of a more austral type, derived from or related to that of the adjacent Mexican mainland. The higher mountains are crowned by oak and pine forests, and in the more arid parts monstrous forms of plant-life have been developed, which give the landscape an aspect of unreality. Several remarkable genera are peculiar to the peninsula. As a result of the expedition twenty-two new species were discovered. Good plates are given of the more interesting plants, and among those especially noteworthy from the dry regions are *Pachycormus discolor* (Anacardiaceæ), a monotypic genus confined to the peninsula, *Fouquieria peninsularis* and *Idria columnaris* (Fouquieriaceæ), reminding one of the extraordinary desert forms of S.W. Madagascar, and *Ibervillea sonorae* (Cucurbibaceæ), with a large woody base.

THE term aerography is a new one, and probably makes its first appearance in an article by Prof. Alexander McAdie, of Harvard University, in the *Geographical Review* for April (vol. i., No. 4). It is suggested to restrict it to a description of the atmosphere at different levels, or, as the author puts it, a description of the structure of the atmosphere. Prof. McAdie pleads that the base-level of the sea, familiar in meteorology, must be discarded in aerography, and replaced by the base of the stratosphere. In this he agrees with the opinion of Sir Napier Shaw. The paper is a short one and much condensed, but it contains some useful suggestions, such as a plea for maps showing the atmospheric conditions at various levels, and for measurements of the vertical flow of air and its cartographical representation. The construction of charts of air structure would have a practical importance to aviators.

THE provision of a standard scale of seismic intensity is a problem which has for many years engaged the attention of seismologists. In his presidential address last year to the Seismological Society of America (Bulletin, vol. v., 1915, p. 123), Prof. A. McAdie suggested that the well-known Rossi-Forel scale had outlived its usefulness, and that it should be replaced by a dynamical scale of intensity. He offered one on the lines of the Omori and Cancani scales, but consisting of ten degrees, of which the lowest corresponds to an acceleration of 1–10 mm. per sec. per sec., and the highest to one of 5000–10,000 mm. per sec. per sec. Prof. McAdie's suggestion is the subject of an interesting discussion in the last bulletin of the society (pp. 177–89). Though the general opinion seemed to be that some absolute scale would in time be adopted, the difficulty of determining the intensity accurately from seismographic records is noticed, and also, if it were otherwise, the impossibility of providing the instruments in sufficient number. The wide variations of intensity within a limited area, such as Prof. Milne showed to exist in his seismic survey of Tokyo, might also have been mentioned as militating in favour of the Rossi-Forel or a similar scale.

SCIENTIFIC PAPER No. 264 of the U.S. Bureau of Standards, by Messrs. Middlekauff and Skogland, deals with the photometry of gas-filled tungsten incandescent lamps. It is found that when the volts on such a lamp are kept constant the current transmitted and the candle-power are higher when the tip is up than when down. If the lamp is rotated about a vertical axis the current increases, reaches a maximum, decreases to its initial value at a speed depending on the shape and number of loops of the filament, and at higher speeds decreases still further. The changes are greater with the tip up than with it down, and the candle-power in each case changes in the opposite direction to the current. The authors have succeeded in tracing these curious effects to the convection currents in the gas in the lamp. They suggest that in the practical tests of such lamps the speed of rotation should be so chosen that both current and candle-power have the normal values. For lamps of similar construction this speed is fixed, and is in many cases 30 or 40 revolutions per minute.

IN a paper read before the Society of Chemical Industry on April 3, Prof. H. E. Armstrong urged the formation of an Imperial Society of Scientific and Industrial Chemistry, similar in character to the Royal Medical and Chirurgical Society, which in 1907 united the activities of seventeen previously existent societies of medical men. Prof. Armstrong enumerates more than a dozen societies, now entirely independent, which could be made constituent societies of such an Imperial Union He points out the necessity of co-operation in order to ensure the progress of chemical science and chemical industry, both terms being used in their broadest meaning, lays stress on the evil arising from the ever-increasing specialisation amongst chemists, and emphasises the present waste of effort involved in the publication of so many overlapping journals. Mr. C. T. Kingzett, in an article in the *Chemical Trade Journal* for April 8, develops the same theme. He advocates the establishment of a "real" Institute of Chemistry, to comprise the present Institute, the Chemical Society, Society of Chemical Industry, etc. He also indicates the waste of time, energy, and money involved in the present independent status of the various chemical associations, and remarks on the narrowing influence resulting from the lack of mutual association between them.

The April part of *Science Progress* contains several articles of interest. Sir Ronald Ross contributes a further instalment of his researches into the theory of equations; Dr. Johnstone, under the slightly misleading title, "The Mathematical Theory of Organic Variability," provides an elementary account of the genesis of Prof. Pearson's family of frequency curves; and Mr. C. Mansell Moullin discusses the natural history of tumours. Other contributors are Prof. Fraser Harris and Mr. Joseph Offord. A valuable feature is a sketch of recent progress in various departments of science under the heading, "Recent Advances in Science." Few readers will dispute the justice of the bitter strictures which bulk largely in the editorial notes upon our national neglect of science.

OUR ASTRONOMICAL COLUMN.

Comet or Nebulous Minor Planet?—At the Königstuhl Observatory a photograph taken on April 3 showed what seemed to be a new minor planet, which received the designation 1916 ZK. Its daily motion was −0·6m. and +3′, whilst its magnitude was 13·0 (*Astronomische Nachrichten,* 4841). Three days later, on another photograph, it presented a nebulous appearance. This was more strongly developed by April 27 (*Astronomische Nachrichten,* 4843). Dr. Max Wolf's observations have been confirmed at the Babelsberg Observatory (*Astronomische Nachrichten,* 4843). On April 30 the nebulosity involved a stellar nucleus. This remarkable body evidently bears a likeness to Neujmin's comet 1913*c,* which resembled a minor planet when first discovered, but a few days later developed a weak cometic chevelure; and the latest observations indicate that it is really a new comet. The position of the object on discovery was:—April 3, R.A. 12h. 52·9m., declination +0° 11′; on April 30, 12h. 58·9m., +2° 39·6′. The daily motion on April 27 was −0·5m. and +5′ and the magnitude was 13·3.

The Pole Effect in the Calcium Arc.—Important quantitative details concerning the pole effect in the arc spectrum of calcium (λλ 3000–4200) are given by Messrs. Gale and Whitney in the *Astrophysical Journal* (vol. xliii., No. 2). The measures of spectra from a horizontal arc 4 mm. long, carrying 4 amperes on a 110-volt circuit, with calcium electrodes 7 to 10 mm. in diameter, indicate a progressive change of from 0·01 to 0·02 tenth metres between positive and negative pole correlated with the series classification of the lines. Although the pole effect seems to be independent of the vapour density of the radiating ions, negativing the suggestion that it is due to the internal pressure of the arc, yet it shows a parallel relationship with the pressure shift. Very significant is the reversal of the gradients of both intensity and pole effect observed when the current is reversed in an arc having one pole of silver, the other being of calcium. The authors suggest that the pole effect depends on the amplitude of vibration of the electrons.

The Rotation of Nebulæ.—Some additional data concerning rotating nebulæ have been obtained at the Lick Observatory by W. W. Campbell and J. H. Moore (Bulletin No. 278). In spectrograms of the complicated planetary nebula in Aquarius, N.G.C. 7009, taken with the slit set on the major axis of the image, the maximum displacements of the two chief nebular lines indicate a rotational velocity of 6 kilometres per second at a distance of 9 seconds of arc from the nucleus; the inclination of the lines gave a similar result. In the case of N.G.C. 6543, the historic planetary in Draco, the central portion of the nebula, about 6·7″ diameter, is rotating about an axis in P.A. 130°, with a velocity of 5 km./sec. In both cases the nebular lines, in addition to the general inclination, are also somewhat contorted, indicating lower velocities in the outer regions. These observations lead to some very interesting conclusions regarding the probable masses of the nebulæ. Corresponding to an inferior limit of distance of 100 light-years, their respective masses would be 11·3 and 2·8 times solar, whilst the mean density of N.G.C. 7009 would be of the order of 1×10^{-6} times that of hydrogen at 0° C. and 1 mm. of mercury. The density of N.G.C. 6543 appears to be about five times as great. It is considered that the evidence indicates that planetary nebulæ must be regarded as three-dimensional objects. In this connection it was suggested many years ago that a bright ellipsoidal shell viewed from a distance would present the appearance of a ring nebula.

NATIONAL DEFENCE AND DEVELOPMENT IN THE UNITED STATES.

THE proceedings of the American Association for the Advancement of Science at its annual meeting held at Columbus at the end of last year were characterised by a large number of papers read before the section devoted to Social and Economic Science on various aspects of national defence and development, a reprint of which appears to the number of eleven articles in the *Scientific Monthly* of New York for the month of April.

The events of the European war seem to have awakened in the minds of the economists of the association dire anticipations of similar devastating results to the United States so soon as the war is concluded, and they have hastened to recommend the most extraordinary provision and a vast expenditure in order to place the nation in a condition of complete defence by the establishment of a standing army of from half a million to a million men, of a great reserve, and of a navy at least equal to that of the greatest European naval Power. The doctrine of "preparedness" seems to have taken firm root amongst them, together with the dictum quoted from Washington, "To be prepared for war is the most effective means of promoting peace." The success of Germany in the early days of the war, and the efficiency of her military arrangements, have evidently made a deep impression on the American mind. It is pointed out, for example, that England spent 53½ years of the nineteenth century in war, and France not much less, whilst Prussia spent but thirteen years, the result of her extraordinary preparedness. As a result of her efficiency, she "quickly finished her fights and got back to work. The wars of the other nations were long drawn out, due, as we know, to the necessity of their learning and preparing to fight after their wars had begun."

It is claimed that a condition of perpetual and